

CLAIMS

We claim:

- 1 1. A method of generating morphemes from received speech, the method
2 comprising:
3 selecting candidate sub-morphemes from the received speech;
4 selecting salient sub-morphemes from the candidate sub-morphemes based on
5 salience measurements; and
6 clustering the salient sub-morphemes based on similar characteristics into
7 morphemes.
- 1 2. The method of claim 1, wherein the generated morphemes are one of acoustic
2 and non-acoustic morphemes.
- 1 3. The method of claim 1, wherein the similar characteristics used to cluster the
2 salient sub-morphemes are semantic and syntactic similarities.
- 1 4. The method of claim 1, wherein the generated morphemes are used by a speech
2 recognition and understanding system.
- 1 5. The method of claim 1, wherein the received speech is training speech.
- 1 6. The method of claim 5, wherein the step of selecting candidate sub-morphemes
2 further comprises:
3 filtering the training speech;
4 selecting all observed phone sequences of a predetermined length; and
5 selecting as candidate sub-morphemes the phone sequences that are of at least
6 the predetermined length.

1 7. The method of claim 4, wherein the training speech comprises at least one of verbal
2 and non-verbal speech.

1 8. The method of claim 7, wherein the non-verbal speech comprises the use of at least
2 one of gestures, body movements, head movements, non-responses, text, keyboard entries,
3 keypad entries, mouse clicks, DTMP codes, pointers, stylus, cable set-top box entries,
4 graphical user interface entries and touchscreen entries.

1 9. The method of claim 1, wherein the speech includes multimodal forms.

1 10. The method of claim 1, wherein the speech is one of transcribed and untranscribed.

1 11. The method of claim 1, wherein the salient sub-morphemes are selected using a test
2 for significance.

1 12. The method of claim 1, wherein the salient sub-morphemes are clustered into
2 morphemes using a distortion measure between the salient sub-morphemes.

1 13. A computer-readable medium storing a database of morphemes generated from
2 received speech, the database generated according to a method comprising:
3 selecting candidate sub-morphemes from the received speech;
4 selecting salient sub-morphemes from the candidate sub-morphemes based on salience
5 measurements; and
6 clustering the salient sub-morphemes based on similar characteristics into morphemes.

1 14. The computer-readable medium of claim 13, wherein the generated morphemes are
2 one of acoustic and non-acoustic morphemes.

1 15. The computer-readable medium of claim 13, wherein the similar characteristics
2 used to cluster the salient sub-morphemes are semantic and syntactic similarities.

1 16. The computer-readable medium of claim 13, wherein the generated morphemes
2 are used by a speech recognition and understanding system.

1 17. A natural spoken language system having a speech recognition and speech
2 understanding modules, the natural language system using morphemes generated by a
3 method comprising:
4 selecting candidate sub-morphemes from received speech;
5 selecting salient sub-morphemes from the candidate sub-morphemes based on
6 salience measurements; and
7 clustering the salient sub-morphemes based on similar characteristics into
8 morphemes.

1 18. The natural language system of claim 17, wherein the morphemes are one of
2 acoustic and non-acoustic morphemes.

1 19. The natural language system of claim 17, wherein the received speech is training
2 speech that includes at least one multimodal component.

1 20. The natural language system of claim 19, wherein the at least one multimodal
2 component comprises one of gestures, body movements, head movements, non-
3 responses, text, keyboard entries, keypad entries, mouse clicks, DTMF codes, pointers,
4 stylus, cable set-top box entries, graphical user interface entries and touchscreen entries.